STAT

A REPORT
on
Boelkau Dam

Prepared by
Project Treasure Island
for
Directorate of Intelligence, USAF
1954

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B O E L K A U D A M (P O L A N D)

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Boelkau Dam in Poland

This report covers information on the Boelkau Dam on the Radaune River, which serves for the production of power. The dam was built by, and belonged to the Free State of Danzig until after the Second World War, and is now on Polish territory.

The report is the result of a study of German open sources, published between 1921 and 1935, listed in the attached bibliography.

The information is compiled in accordance with the P.V.D. questionnaire as follows:

I. Functions

A. The system of which the dam forms a part

See Fig. 1

A chain development of dams and power plants was constructed on the Radaune River in order to utilize its electric power capacity. The dams and power plants at Lappin, Boelkau and Straschin-Prangschin were built at Prangschin II, Hammermuhle and Gischkau. Gischkau serves as a run-of-river plant while the other plants provide the peak-load supplies.

B. The dam within the system

See Figs. 2 and 3

The Boelkau Dam near the community of Kahlbude is the second downstream dam on the Radaune River. It forms a small reservoir in the Radaune River. A diversion canal leads into the larger supply reservoir which stores the water needed for the peak-load hydroelectric power plant of Boelkau.

C. Highways and/or railways resting on the dam or adjacent thereto

The Danzig-Kahlbude road crosses the canal near Kahlbude on a reinforced concrete bridge. The road Boelkau-Loblau crosses the penstock (as seen in Figs. 2 and 4) also on a reinforced concrete bridge. For railroad lines and highways in the vicinity of the dam and power plant see Figs. 1 and 2.

D. Navigation locks in connection with dam

There is no lock.

II. Location and designation

A. Data which will make possible pinpointing the installation

As seen in Figs. 1 and 2, the Radaune River makes a sharp bend, about 12 km long, between the communities of Kahlbude and Boelkau; here a cut-through of the river was effected. The dam was constructed upstream of Kahlbude.

B. Official, local, and popular names of dams and dependent installations

German names of rivers and communities were used in this report because only German sources were available. Since the dam and power plant are now on Polish territory, Polish names are now in usage. (Danzig - Gdansk; Radaune River - Radunia River; Lappin - Lapino; Straschin - Straszyn; Hammermuhle - Kuznica; Gischkau - Juszkowo; Kahlbude - Kolbudy).

III. Dimensions

A. Dam

1. Maximum and minimum head on dam

The normal head on the dam is 5 m.

2. Maximum and minimum depth of water below dam

No information available.

3. Total height of dam above river bed and above foundations

The crown of the fixed part of the dam is at 85.50 m elevation; that is 5.50 m above the river bed.

4. Elevation of bottom of penstocks at dam

There is no penstock at the dam. The 2 piers of the dam have waste outlet sluices each 2.4 sq m, equipped with double gates (see Fig. 3).

5. Total thickness at base and at high water level

No information available.

6. Slopes of dam faces

See Fig. 3.

7. Length at crown, across river bed and along spillway

There are 3 gates, each about 12.2 m wide. For the approximate length of the dam see Fig. 3.

B. Reservoir

There are actually 2 reservoirs:

1) Reservoir No. 1, formed by the dam in the Radaune River.

2) Reservoir No. 2, a large storage reservoir, for the formation of which a natural depression in the landscape was used and which is fed by the diversion canal.

Reservoir No. 1

1. Capacity

Normal capacity: 128,000 cu m.

2. Area

Area of maximum water level: 6.6 hectare.

3. Length, width and depth

Length: 900 m

Width: The source describes the reservoir as narrow.

4. Detailed plan in vicinity of dam

See Figs. 1 and 2.

Reservoir No. 2

A natural depression, supported on three points by retaining walls, forms the storage reservoir located between Kahlbude and Boelkau (see Fig. 2).

1. Capacity

2,450,000 cu m.

2. Area

54 hectare (when water level reaches 86 m elevation).

3. Length, width and depth

Length: about 1,500 m.

See Fig. 2.

4. Detailed plan in vicinity of dam

Reservoir No. 2 does not adjoin the dam. As seen in diagram Fig. 2, there are 3 retaining walls. Their total crown length is 700 m. The maximum height is 3.5; 5.5 and 7.5 m respectively. On the side facing the water the walls have

a 1:2.5 incline; on the other side the incline is 1:3. The crest of the walls is 3 m wide and is 1.50 m above the normal water level of the reservoir.

C. Navigation locks in connection with dams (structural details)

There is no navigation lock.

IV. Hydrological data (rainfall, flow, etc.)

The Radaune River is a tributary of the Mottlau River. Its source is in a lake region. High precipitation and spring thaws are absorbed by the lakes and reach the Radaune River slowly, in limited quantities. Thus there are no major differences between the maximum and minimum flow of the Radaune River.

The catchment area at Kahlbude is 644 sq km, the medium flow 5.3 cu m/sec.

V. Foundation conditions and soil characteristics under and near the dam

The foundation consists of a clay strata.

VI. Design data

A. Structural type or types

The Boelkau Dam is a concrete gravity dam equipped with 3 spillway gates.

B. Material used

Concrete is used for the dam construction.

C. Design criteria

No information available.

D. Details and equipment (penstocks, control gates, inspection galleries, cranes, etc.)

Conduits

As seen in Fig. 2, there is a canal leading from the dam to Reservoir No. 2. The canal intake adjoins the dam to the left. It can be closed by a wooden gate 4.80 m wide and 3.50 m high, and also by stoplogs.

The conduit is 1,400 m long and can carry 20 cu m/sec if the water level of the reservoir at the dam is at 86 m elevation. The cross-section of the canal is 24 sq m, the depth 3.20 m and the width at maximum water level 14 m. Its foundation consists of a clay layer 25 cm thick. There is a double sluice gate where the canal flows into Reservoir No. 2, which is operated manually.

Cut-off

To facilitate the construction of the canal, a cut-off in the Radaune River, just below the dam, had to be undertaken (see Fig. 2). The cut-off is 200 m long and at its end a 3-m high concrete drop was constructed to regulate the speed of water. The foundation and sides of the cut-off consists of sexagonal concrete plates on a layer of gravel.

Shutter-gates

The dam has 3 shutter-gates, each 12.2 m wide and 50 cm high. They work automatically with the help of a counterweight. There is an additional automatic gate in the side wall of the dam, which lies between the dam and the canal intake (see Fig. 3) and is 8 m wide.

Outlet works

As seen in Fig. 3, there is in each of the 2 piers an emergency outlet sluice. Each outlet is closed by a double sluice gate of 2.4 sq m cross-section.

VII. Special data on power dams

A. Capacity (kva), present and proposed

Installed: 9,000 kva.

B. Output (kwh/yr), achieved and proposed

14,000,000 kwh/yr (estimated in a 1925 source).

C. Powerhouse

1. Location

For the location of the powerhouse see Figs. 2 and 5. It is located on what used to be an island in the Radaune River.

2. Structure

The powerhouse is a brick building with granite ornaments. The generator room is 14 by 23 m large.

3. Installations

(See Fig. 5)

There are 3 turbine-generator horizontal units each 3,000 kva, 2,250 kw, 6,300 V, 500 rpm, designed for a net head of 42.3 m and a discharge of 7 cu m/sec.

The turbines are manufactured by Voith, Heidenheim, the generators were delivered from the Siemens-Schuckert Werke.

Each generator is connected to a 3,000 kva 6/35 kv transformer (see Fig. 5).

The bus and switch equipment are installed in a switch-house adjacent to the powerhouse (see Fig. 6).

4. Number, location and type of penstocks

(See Fig. 4).

The penstock consists for the first 830 m of a reinforced concrete pipe with the inner diameter of 3.6 m and walls 35 cm thick, and the following 166 m of a steel pressure pipe of 3 m diameter and 10-15 mm thick walls. The cross-section of the concrete pipe is 12.00 sq m and the pipe has a Terkret lining. The pipe is designed for 21 cu m/sec. As seen in Figs. 2 and 4 an outlet pipe of 35 cm diameter and closed by a valve, serves to empty the penstock when necessary.

A surge-tank interrupts the penstock at a point about 90 m from where the steel pipe joins the concrete pipe. The surge-tank is 17 m high and has an inner diameter of 12 m. It has a red brick roof and a wooden gallery and stands as a landmark for the Boelkau Hydroelectric Power Plant. The lower part of the penstock, the steel pipe, is supported by concrete pillars, spaced at an interval of 6-7 m. Before reaching the turbines, the pipe divides into 3 branches which are equipped with butterfly valves. The equipment was made by the Kolsch-Folser Werke, Siegen und Werft Klawitter, Danzig.

Tailrace

The tailrace is 125 m long, at maximum water level the surface is 12 m wide and it is 1.80 m deep.

D. Places of installations served; ties with power grids

See Fig. 5.

E. Location and description of transformer yards and transmission system

According to a 1925 source there is a sub-station in Danzig.

No recent information is available (see paragraph I.-A).

VIII. Historical data

A. Name and background of designer

The Siemens GMBH, Danzig and the Siemens-Bauunion, built the Boelkau Power Plant.

B. Dates of construction

Completed in 1925.

C. Sources of material

No information available.

D. Records of war damage, failures, removal of equipment, etc.

No information available.

E. Data on conditions of structure at any date

No information available.

F. Proposals for enlargement, alteration or extension of function

See Chapter I, A and B.

IX. Graphical material

A. Photographs, especially those taken during construction

Photographs attached to this report are shown in Figs. 3 and 5.

B. Working drawings, general and detailed

Not available.

C. Record and publication drawings

Drawings attached to this report are shown in Figs. 1, 2, 4, 5 and 6.

D. Sketches by persons who have seen installation

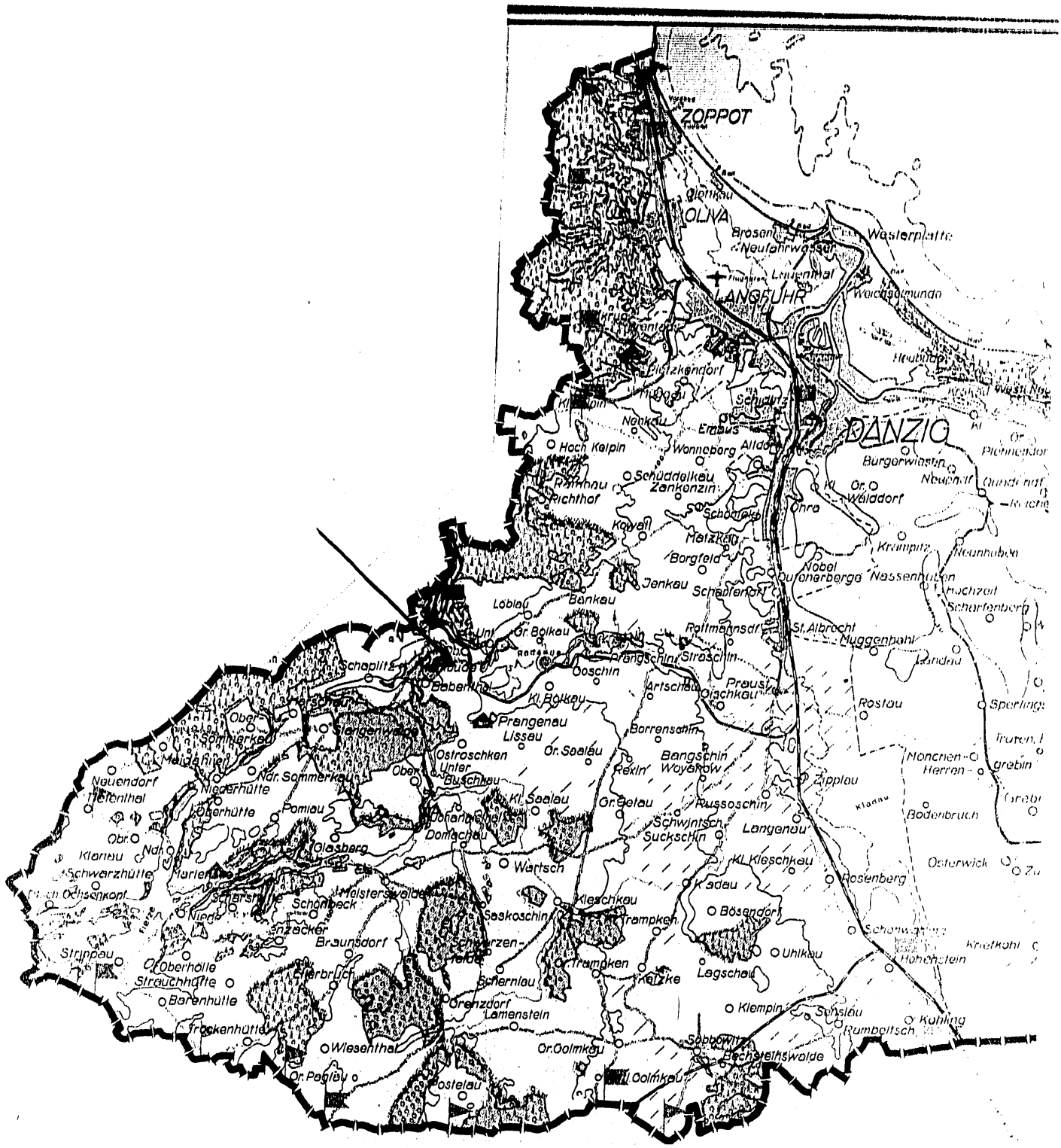
Not available.

BIBLIOGRAPHY

1. Lacob, K, and Lieblsch, C., DAS RADAUNEWERK DER FREIEN STADT DANZIG. Elektrotechnische Zeitschrift (Berlin), Vol. 46, 1925, pp. 1371-1374 and 1408-1412.

2. AUSBAU DER UNTEREN RADAUNE. Deutsche Wasserwirtschaft (Stuttgart), Vol. 30, No. 1, 1935, p. 18.

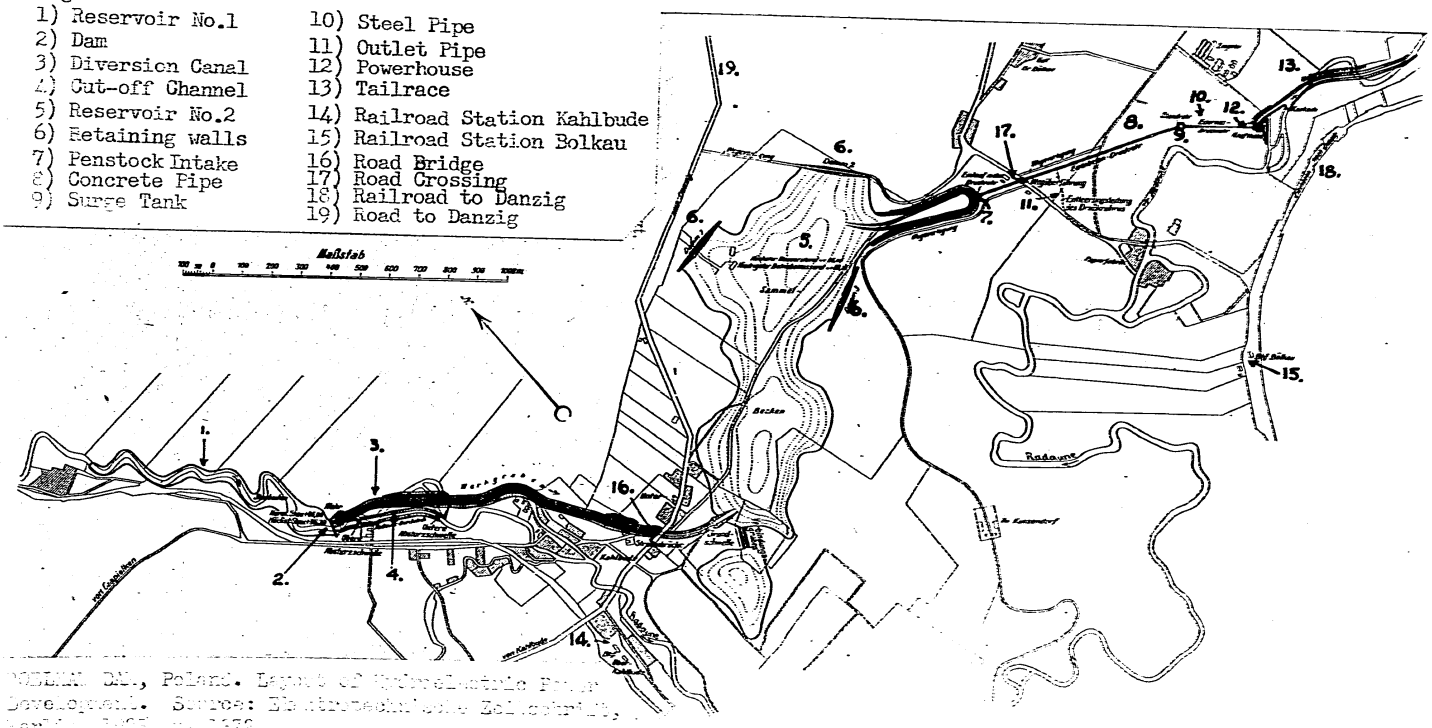
3. Roessler, G., DIE ELEKTRIZITATSVERSORGUNG UND DIE ELEKTRIZITATS-GESETZGEBUNG DER FREIEN STADT DANZIG. Elektrotechnische Zeitschrift (Berlin), Vol. 42, No. 13, March 1921, p. 304.



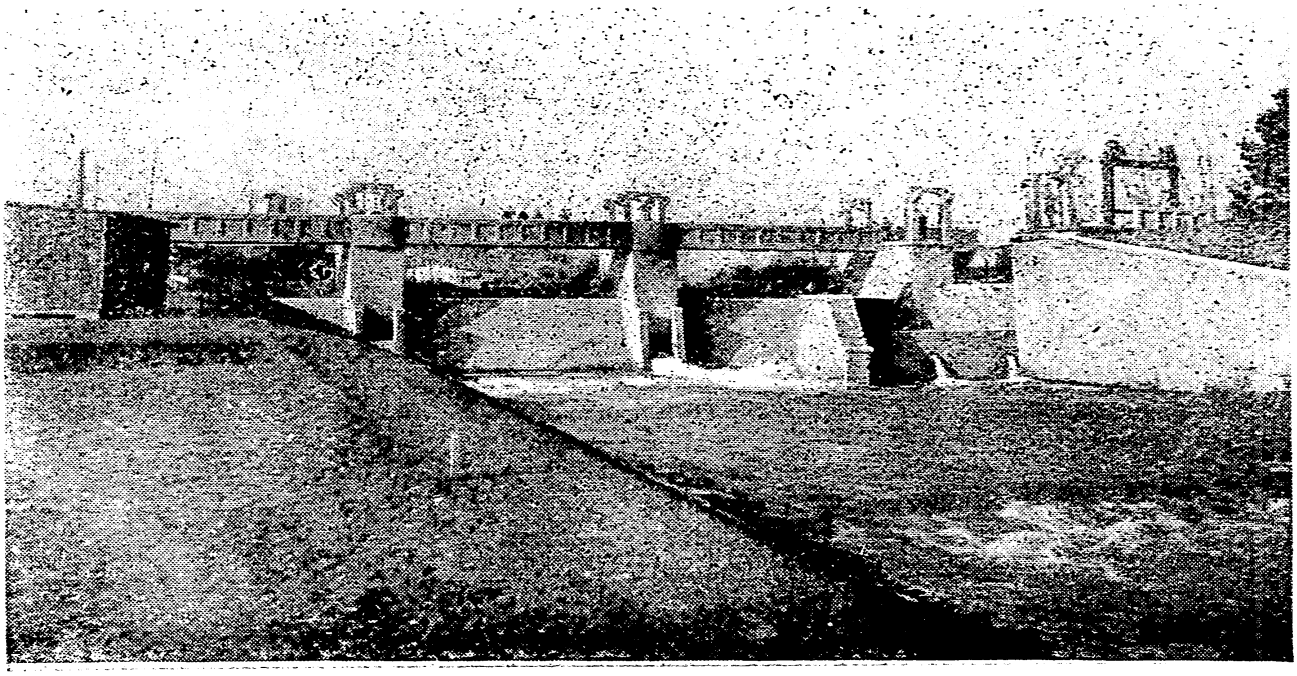
BOELKAU DAM, Poland. Map published by: Danziger Heimat[illegible]
Scale: 1: 200,000

Legend:

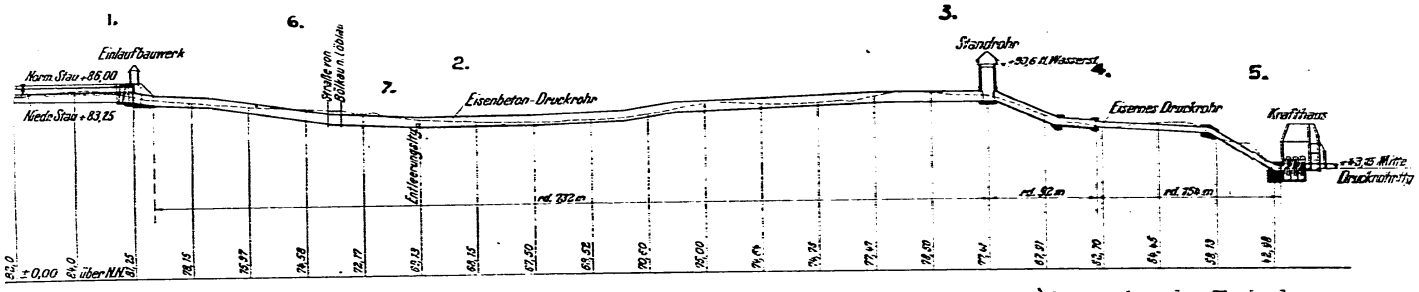
1) Reservoir No.1
2) Dam
3) Diversion Canal
4) Cut-off Channel
5) Reservoir No.2
6) Retaining walls
7) Penstock Intake
8) Concrete Pipe
9) Surge Tank
10) Steel Pipe
11) Outlet Pipe
12) Powerhouse
13) Tailrace
14) Railroad Station Kahlbude
15) Railroad Station Bolkau
16) Road Bridge
17) Road Crossing
18) Railroad to Danzig
19) Road to Danzig



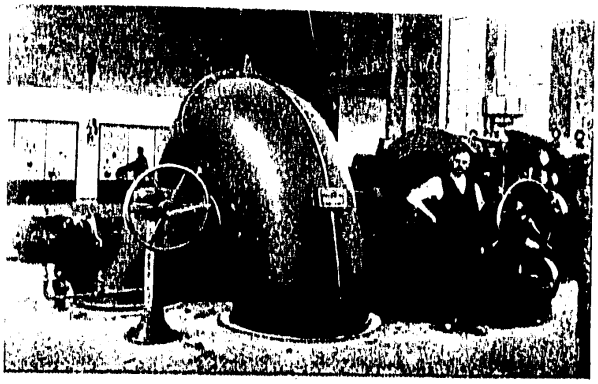
...DELIN DL., Poland. Legend of Hydroelectric Power Development. Source: Elektrowerkschaftliche Zeitschrift, Berlin, 1952, p. 1378



BOELKAU DAM, Poland. Dam at Kahlnrde.
Source: Elektrotechnische Zeitschrift,
Berlin, 1925, p. 1373

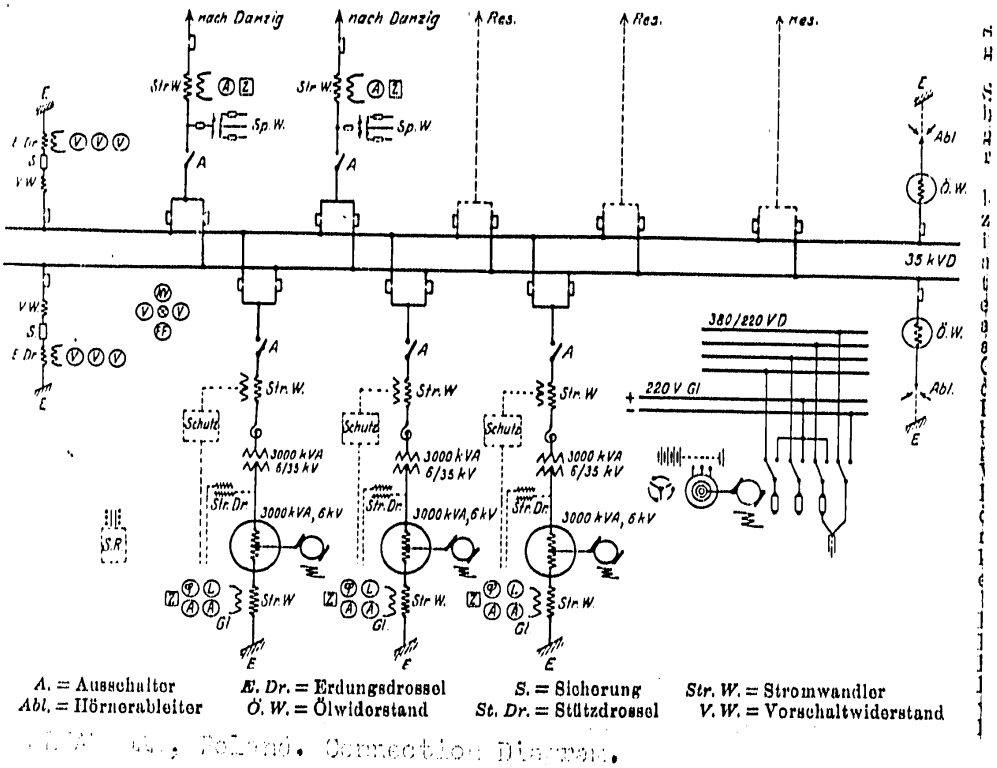


BOLKAU DAM, Poland. Longitudinal Section of Penstock. 1)Penstock Intake 2) Concrete Pipe 3) Surge Tank 4) Steel Pipe 5) Powerhouse 6) Road Crossing 7) Outlet Pipe
Source: Elektrotechnische Zeitschrift, Berlin, 1925, p. 1417



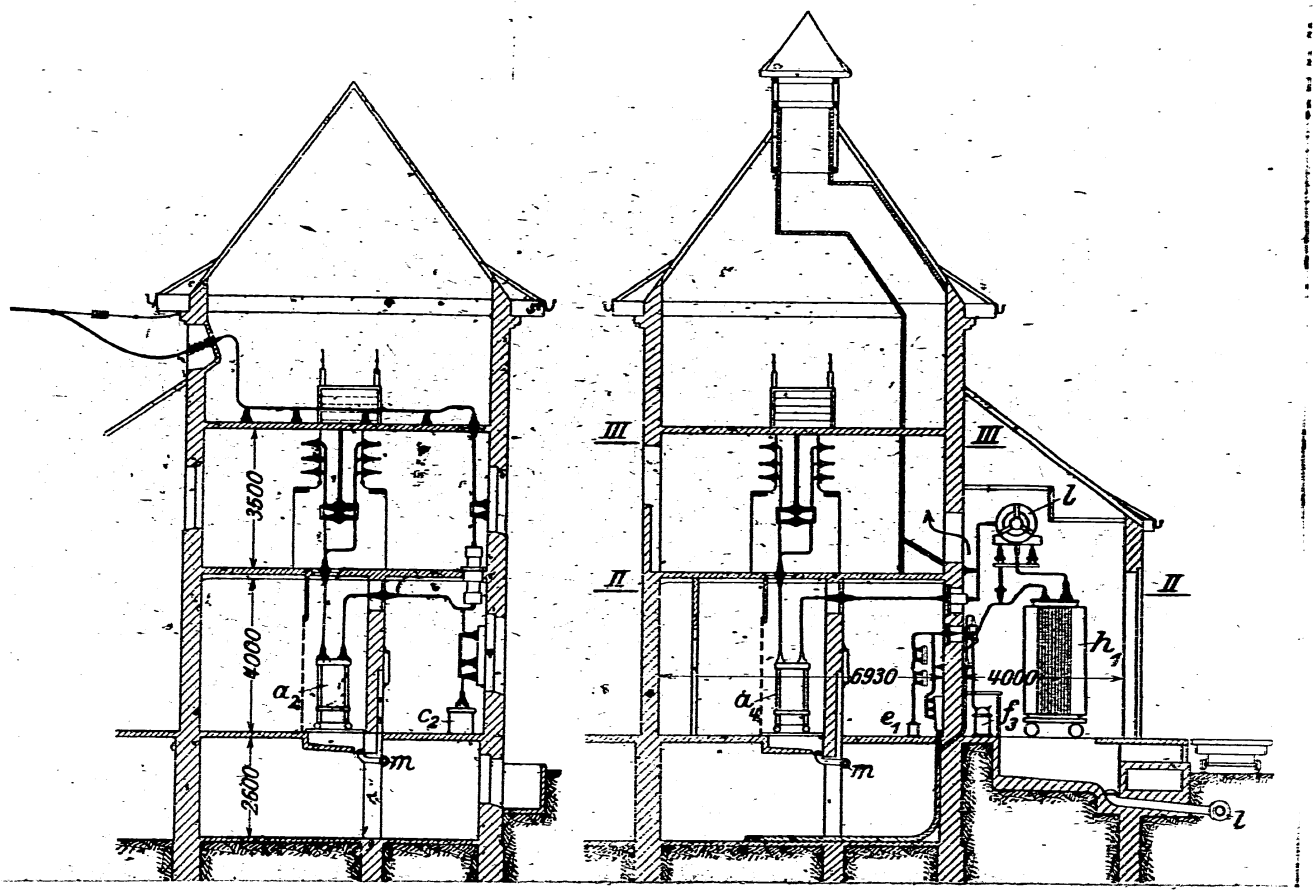
[illegible] Poland. Generator [illegible]

[illegible] Poland. [illegible] Railroad.



[illegible] Poland. Connection Diagram.

[illegible]: Elektrotechnische Zeitschrift, Berlin, 1925, p. 1169



BOELKAU DAM, Poland. Section Through Switch-House.
Source: Elektrotechnische Zeitschrift, Berlin, 1928
p. 1411